## REMARKS

Claims 2-10 and 50-60, all the claims pending in the application, stand rejected. On the basis of the following comments, Applicant respectfully submits that all the claims are patentable.

### *Listing of Pending Claims*

As a preliminary matter, Applicant notes that the Examiner has erroneously listed claim 1 as pending. Claim 1 was cancelled in the previous Amendment and is not subject to further examination.

### *Claim Rejections - 35 U.S.C. § 102*

**Claims 2-5 are rejected under 35 U.S.C. § 102(b) as being anticipated by Minami et al. (5,555,310).** This rejection is traversed for at least the following reasons.

As the Examiner is aware, a claim can be anticipated "***only if*** each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference."[1] As demonstrated subsequently, there can be no anticipation by Minami et al because there is no teaching of a "synthetic aperture microphone processing capability," as disclosed and expressly claimed, in both pending independent claims 2 and 4.

Specifically, Claim 2 is limited to a device for that can perform both adaptive acoustic stereo echo canceling and synthetic aperture microphone processing capabilities. As shown below echo canceling and synthetic aperture microphone capabilities are very distinct.

[1] MPEP §2131 (8th Edition); *Verdegaal Bros v. Union Oil Co. of Cal.*, 814 F.2d 628, 631(Fed. Cir. 1987).

Similarly, Claim 4 is limited to a device that has an associated plurality of microphones, and includes synthetic aperture microphone processing capabilities.

Thus, both independent claims require that the device must have synthetic aperture microphone processing capabilities. Applicant respectfully submits that the cited Minami reference absolutely does not teach anything close to a synthetic aperture microphone, and that the Examiner's argument of inherency is improper and inapplicable The reasons for this are set out in detail below.

**Understanding Of "Synthetic Aperture Microphone" Terminology In Established Art**

As an initial point, the rather specialized technology of synthetic aperture microphone processing is exemplified in the examples of Figs 9-13 of the present application. Also, it is proper to define exactly what a synthetic aperture microphone is. (Other commonly used names for this technology, particularly in more contemporary applications, are "beam-forming microphone arrays," "steerable-beam microphone arrays," "zoom microphones," and "adjustably directional microphones.")

Specifically, the "synthetic aperture microphone" technology is a microphone-only signal processing technology. There are no speakers are involved. The resulting directionally- and regionally-sensitive microphone audio output signals may be directed to any number of uses and equipment, including speech recognition hardware, recording equipment, and signal analysis systems, none of which have any speakers. Thus, this speaker-irrelevant, microphone-only signal processing technology has absolutely nothing to do with transfer functions between microphones and speakers.

Rather, synthetic aperture microphone technology comprises a plurality of microphones whose electrical signal output is directed to multiple-input signal processing to produce a single outgoing signal output that has enhanced sensitivity in a selected geometrically-defined region within the pick-up region of the plurality of microphones, and enhanced rejection outside this geometrically-defined region. The sculpting of the geometrically varying response in the resulting results from individually adjusting the amplitude, phase and/or delay of each incoming microphone signals and additively combining these adjusted signals to produce the single outgoing signal output. The region of enhanced sensitivity may be fixed (via fixed adjustments of the amplitude, phase and/or delay of each incoming microphone signals), controllable (via controllable adjustments of amplitude, phase and/or delay of each incoming microphone signals), or adaptive (via adaptive adjustments of amplitude, phase and/or delay of each incoming microphone signals),

In support of this, Applicant is enclosing several items from the technical literature, and additional citations below. Many other examples may be found on the web and upon library search.

- Slides 1-6 of the presentation "Beam-Steering Engine for a Two-Dimensional Microphone Array" by Miller et al., available on the web at http://www.vlsi.uwindsor.ca/presentations/makki2_seminar_1.pdf. Slides 3 and 6 describe the functionality and attributes delivered by the technology as Applicant has adapted and applied it in the present invention. Slide 4 describes the

technology, and slide 6 pictorially depicts the principles employed. None of this is mentioned or taught anywhere in Minami.

- "Advanced Microphone Technology" by Loppert et al, available at http://www.knowlesacoustics.com/images/pdf/white/AdvancedMicTechnology.pdf . The material in the last line of page 2 through page 4 provides additional background. Again, nothing of the sort is mentioned or taught anywhere in Minami.
- There are also at least two books on the subject:
    - "Sound Capture for Human / Machine Interfaces: Practical Aspects of Microphone Array Signal Processing (Lecture Notes in Control and Information Sciences)" by Wolfgang Herbordt, Springer, ISBN 3540239545, has the excerpt from page 1: "... For suppression of local interferers and noise, beamforming microphone arrays are very effective since they suppress interference and noise by ..."
    - "Microphone Arrays : Signal Processing Techniques and Applications" by Michael Brandstein and Darren Ward (Eds), Springer, ISBN 3540419535.
- Abstract of a publication entitled "The Model of A Highly Directional Microphone", by Ruser, Detlev et al., available at http://www.aes.org/e-lib/browse.cfm?elib=6628 , describes a laboratory model of a microphone for estimating the directional properties of a stationary sound field. The abstract

states that a high angular resolution may be obtained through the principle of "synthetic aperture."

- "Multi-Microphone Signal Acquisition for Speech Recognition Systems" by Kevin Fink, available at http://www.fink.com/papers/ee586.html, indicates "By using acoustical beamforming techniques, the microphone array can "focus" on the speaker's position. By knowing the speaker's position, the individual microphone outputs can be combined in such a way as to add the separate signal contributions while cancelling the noise contributions. Improved performance can be attained by adding aperture shading to the system. Rather than simply summing the appropriately delayed microphone outputs, the signals are multiplied by different gain factors (or weights) before summing. This provides the effect of shading the aperture, giving the ability to trade between beamwidth and sidelobe attenuation. If the position of the desired signal source is known and constant, the appropriate delays can be set up beforehand and then be left alone."

**Minami does not teach Synthetic Aperture Microphone Processing Capability**

The Examiner points to the teachings in Minami et al that require adjusting transfer functions between microphones and speakers, as described at col. 4, line 66-col. 5, line 52, in support of the contention that Minami teaches a synthetic aperture microphone.

However, it does not. Minami teaches *echo cancellation, which requires the synthesis of an synthetic echo path*, not synthetic aperture microphone processing. Indeed, the material cited in the Minami patent by the Examiner states:

> "An echo canceller, applied to a voice input apparatus including a plurality of audible sound output units for outputting a plurality of audible sounds obtained such that sound image localization control or an input monaural voice signal is performed on the basis of a plurality of pieces of sound image localization control information using at least one of a delay difference, a phase difference and a gain difference as information, and performing a sound image localization at a position corresponding to a position of an image displayed on a display means and an audible sound input unit for inputting an audible sound, for estimating acoustic echoes input from the plurality of audible sound output units to the audible sound input unit, on the basis of estimated synthetic echo path characteristics between the plurality of audible sound output unit and the audible sound input unit, and for subtracting the acoustic echoes from an audible sound input to the audible sound input unit, according to the present invention is characterized by comprising: estimating means for estimating respective acoustic transfer characteristics between the plurality of audible sound output units and the audible sound input units on the basis of present sound image localization control information, past sound image localization control information, a present estimated synthetic echo path characteristic, and a past estimated synthetic echo path characteristic; and generating means for, when the position of the image displayed on the screen changes, generating a new estimated synthetic echo path characteristic on the basis of the new sound image localization control information and the new acoustic transfer characteristics which correspond to change in position."
>
> The estimating means is characterized by including means for estimating the respective acoustic transfer characteristics between the plurality of audible sound output units and the audible sound input unit by linear arithmetic processing between the present sound image localization control information, the past sound image localization control information, the present estimated synthetic echo path characteristic, and further including means for performing the linear arithmetic processing by performing multiplication between an inverse matrix of a matrix having the present sound image localization control information and the past sound image localization control information as elements and a matrix having the present estimated synthetic echo path characteristic and the past estimated synthetic echo path characteristic as elements."

From the foregoing, it is clear that the Minami teaching is focused on echoes and synthetic echoes, as one must in designing an echo canceller. Nowhere does Minami describe any of the terms or concepts of synthetic aperture microphone technology, its features, its implementation, or its results. Specifically, Minami makes no mention of (*insert specific features of the synthetic aperture microphone*).

Additionally, the language cited by the Examiner is the applicant's claim language and does not involve a technical teaching. *(Lester, I'm not certain of the point made in this paragraph and the paragraph below plus bullets. I would cancel them.)*

To the extent that there is a disclosure of a relationship among components, Applicant notes that the plurality of loudspeakers would be considered "audible sound output means" and microphones would be considered "audible sound input means", on the basis of the statements at col. 6, lines 56-63. Clearly, given the description in the text cited by the Examiner, some relationship between a speaker and a microphone is required. This relationship serves several purposes, as spelled out by the basis of the detailed teachings in the Minami patent:

- One goal in Minami et al. is to generate sound image localization control information on the basis of a relationship between the audible sound input means and the audible sound output means, with respect to current and past information.
- Another goal is the establishment of a stereo voice transmission capability. In line with this different goal in Minami et al, Fig. 3 illustrates an arrangement in which a plurality of microphones 101R; 101L are coupled with a plurality of speakers 501R, 501L to perform this stereo capture and transmission process. As disclosed beginning at col. 8, line 13, discrimination is made between single and multiple utterances so that efficient transmission of the voice signals can be attained. Additional details for stereo voice signal transfer is provided in cols. 10-14 with regard to Figs 4-8; however, these details do not concern synthetic

microphone aperture processing, as that term is understood in the art, but merely concern stereo encoding.

- Yet another goal is the establishment of a stereo echo canceling capability. Fig. 15 of Minami et al (the Examiner previously had referenced the structure) illustrates a pair of echo-cancellers 600R, 600L that operate on the basis of inputs from a speaker 501 and provide estimated signals relating to pseudo echo for combination with microphone inputs 101L, 101R. The illustrated stereo voice echo canceller is operative to have pseudo echo subtracted from input signals and, thereby, provide stereo voice echo cancellation with reduced processing.

None of these features, nor the teachings involved, nor anything else in the Minami patent has anything to do with a synthetic aperture microphone.

**Adjustable Microphone/Speaker Transfer Characteristics Are Not Applicable**

The Examiner's reference to processing involving a combination of microphone inputs and echo canceller adjustments to the microphone signals, is not the equivalent of a synthetic aperture microphone processing capability. A brief reference to the previously mentioned resource materials should make this clear. Again, no mention of this phrase (*what phrase?*) is used in the patent and no teaching is present that would lead one of ordinary skill to assume that the echo canceller processing is synthetic aperture microphone processing.

Indeed, this is not surprising because the concepts are vastly different. Sound localization or source tracking to identify a sound source location using a microphone array is taught in "Applications of a 3-D Microphone Array," Juha Merimaa, 112th Audio Engineering

Society Convention (2002). (*Lester: please make the connection between this sentence and the previous paragraph.*) This is to be distinguished from the beam forming techniques involving a "synthetic aperture" for suppressing noise using a microphone array, as detailed in Lucabray at pages 5, 6 and 8. Based upon a review of these references, one skilled in the art would clearly understand that the concepts are different.

**Inherency Argument is Improper**

Finally, a "synthetic aperture microphone" is not inherent from the teachings of Minami et al, as the Examiner suggests. The law of inherency is clear and the proof of inherency places a very specific burden on the Examiner. Specifically, in "relying upon the theory of inherency, the Examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings."[2] In addition, "[t]he fact that a certain result or characteristic may occur or be present ... is not sufficient to establish the inherency of that result or characteristic. . . . To establish inherency, the extrinsic evidence 'must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient.'[3] . . ."

The Examiner has not done so nor, it is submitted, is it possible to do so.

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[2] [MPEP § 2112(IV), p 2100-55, Rev. 2, May 2004, citations omitted, emphasis added].

[3] [MPEP § 2112(IV), p 2100-54-55, Rev. 2, May 2004, citations omitted, emphasis added].

Thus, on the basis of the proper interpretation of the term "synthetic aperture microphone processing capability" and the demonstrated difference between such technology and that in Minami et al, there is no express teaching and there can be no inherency. Thus, these claims cannot be anticipated under applicable law.

Moreover, the claims cannot be rendered obvious in view of the teachings of Minami, which has nothing to do with synthetic aperture microphone processing capabilities or its applications.

**Claims 3 and 5**

With regard to dependent claims 3 and 5, these claims would be patentable for the reasons already given with regard to parent claims 2 and 4.

The Examiner asserts that Minami teaches the limitations of claim 5 wherein the synthetic aperture microphone processing capability includes the capability to adjust the position of a spatial region corresponding to the area of maximum sensitivity of the synthetic aperture microphone function. The Examiner refers to col. 21, lines 28-65 for such feature.

However, once again this claim language has no specific teaching that would enable one of ordinary skill in the art to attain a synthetic aperture microphone. Moreover, as already explained, adjustment of a spatial region is substantively different from determining a sound image localization control information, particularly in the context of a microphone. Thus, this limitation in the claims is not met.

**Claims 6-10 and 50-60**

The Examiner has not stated a rejection of these claims. Thus, it is ambiguous as to whether the rejection is on the basis of § 102 for anticipation or § 103 for obviousness. Applicant believes that it has demonstrated that the limitations in these claims, all of which are dependent from independent claims 2 or 4, and therefore contain the synthetic aperture limitation, would not be anticipated.

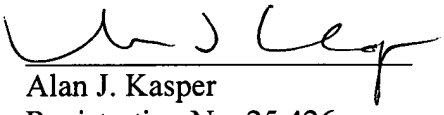
Applicant respectfully submits that the Examiner should carefully consider each and every word of each claim and determine whether the prior art meets such limitations. Applicant would respectfully submit that nothing in these claims with regard to a synthetic aperture is taught by Minami or any other prior art cited by the Examiner. In the absence of such teaching, the Examiner is respectfully requested to find all of the pending claims allowable and to pass the application to issue.

Extended additional prosecution of the application on the basis of unsupported definitions of the claim terms is not warranted. Applicant respectfully submits that they have had their prosecution and now are entitled to receive a patent on the basis of the demonstrated novelty of their invention. To the extent that the Examiner decides to reject any claim on the basis of unpatentabililty, Applicant respectfully submits that the Office Action should be made non-final.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



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